Dynamic Features of the High-Altitude Cusp:IMAGE/LENA Observations

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IMAGE low energy neutral atoms (LENA) imager responds to the neutral atoms formed by the magnetosheath interactions with the hydrogen exosphere during periods of high solar wind dynamic pressure. Detailed analyses of the LENA data have shown that the high-altitude cusp can be monitored because the cusp indentation structure makes the emission have a distinct direction. Most of the cusp emission events include a sudden impulse on the ground, created by the contact of a rapid increase in the solar wind dynamic pressure to the dayside magnetopause. When the sudden impulse timing is compared with the change of the dynamic pressure at ACE spacecraft, the time delay of the solar wind to the magnetosphere can be obtained. Our extensive survey for the cusp emission from near-noon orbits during 2001 has identified a significant number of events. We mapped the motion of the cusp emission on the modeled magnetopause considering the corresponding solar wind conditions, and examined how the high-altitude cusp responds to the variations of the solar wind with a time resolution of 2 min. Results of analyses show that the equatorward/poleward motion of the cusp is prominent as expected, and that the displacements usually do not exceed 1 Re per 2 min. Several events have larger displacements, e.g., 2 Re per 2 min, i.e., about 100 km/s. One such rapid motion event was observed at April 12, 2001, when POLAR/TIDE also measured the corresponding motion of the cusp simultaneously. Our events also include simultaneous observations of IMAGE and SuperDARN radar on April 11, 2001. The ionospheric cusp measured by the radar, and the LENA high-altitude cusp show correlated variations in latitudes. Detailed characteristics of the motion of the high-altitude cusp, including its connection to the ionosphere, will be presented, and discussed in terms of the corresponding variations of IMF and solar wind dynamic pressure.